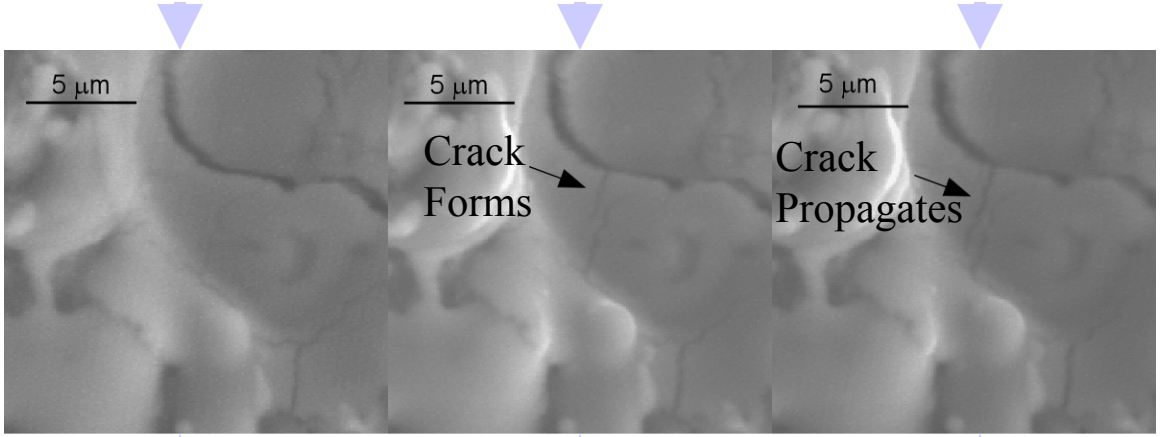
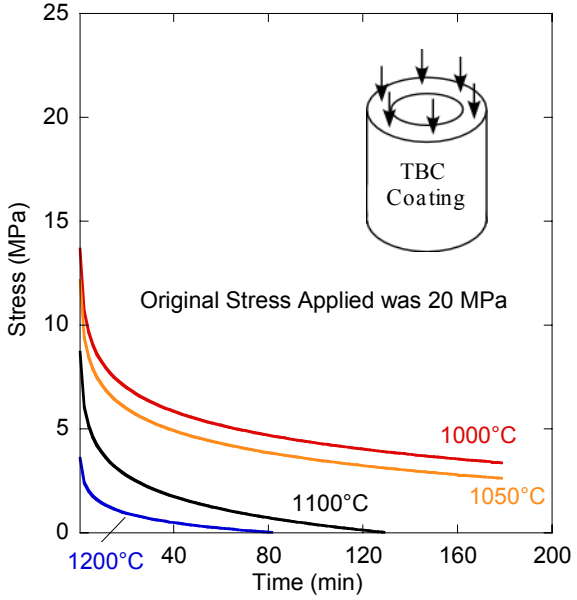
CAREER: High Temperature Deformation of Stand-Alone Plasma-Sprayed 7 wt.% Y_2O_3-ZrO_2

Rodney Trice, Purdue University, DMR 0134286

Research:

Thermal barrier coatings, like 7 wt.% Y_2O_3-ZrO_2, used in gas turbine engines play a critical role in the transportation and energy sectors of the U.S. economy. Full implementation of these important coatings requires an understanding of their fracture behavior at room and elevated temperatures. The series of micrographs above show in-situ observation of crack nucleation and growth during compression loading at three different stress levels. The adjacent plot shows how quickly TBC coatings relax under constant strain at elevated temperatures.





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Education:

Two undergraduates (Jon Levin and Bradley Allison), and two graduate students (Christophe Deschaseaux, and Graeme Dickinson) have been supported by this grant. Mr. Levin, an undergraduate in Physics, has had his paper dealing with in-situ observation of crack growth in plasma-sprayed 7 wt.% Y_2O_3-ZrO_2 recently accepted at the J. Am. Cer. Soc.

Outreach:

To increase the relevance of materials science to non-majors, four unique learning modules have been developed for Purdue's sophomore level materials science course (a course that many non-MSE students take) that demonstrate real-world materials applications. In response to the question, "this module showed me how materials are used in real world applications," a recent section of this class responded as shown in the histogram. This class of nearly 60 students contained 51 non-majors, and 75% seemed to learn from the module.